UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
BERKELEY

AGRICULTURE EXPERIMENT STATION
BENJ. IDE WHEELER, PRESIDENT
THOMAS FORSYTH HUNT, DEAN AND DIRECTOR
H. E. VAN NORMAN, VICE-DIRECTOR AND DEAN
UNIVERSITY FARM SCHOOL

CIRCULAR No. 124
(JANUARY, 1915)

ALFALFA SILAGE FOR FATTENING STEERS

BY
GORDON H. TRUE, F. W. WOLL AND V. F. DOLCINI

While many experiments have been conducted with regard to the use of Indian corn silage in feeding fattening steers, but little is known in regard to the value of other silage crops for cattle feeding. Since the first cutting of alfalfa often consists largely of foxtail and other weeds, and in that case makes a poor quality of hay, it seemed desirable to secure some definite information as to the use of this crop for silage purposes. One of the stave silos at the University Farm was accordingly filled with the first cutting of alfalfa from a weedy field, on April 27th to May 3rd, 1914. This field was so foul with weeds that it would have been practically valueless for hay, the foxtail being nearly ripe and the beards already hard.

A mixed lot of 107 native range steers, mostly three and four year olds, was purchased for the experiment last summer from a foothill ranch near Coyote, California. The better individuals among the steers showed some evidence of Shorthorn, Hereford or Devon blood, but on the whole the steers were rather below the average of California range cattle. They were bought at 6 cents a pound on foot with a 3 per cent shrink, and averaged 963 pounds when weighed at the ranch on the morning of July 6, 1914. After a ten-mile drive to Coyote and twenty-four hours on the cars they weighed, when unloaded at Davis, an average of 883 pounds.

For the first two days at the University Farm, the steers received nothing but long alfalfa hay. On the morning of July 10th, they were started on alfalfa silage with which was mixed rolled barley. No hay was fed for the two following days, in order to accustom the steers to the silage. On July 12th hay was again fed and the ration from this time on consisted of alfalfa hay, alfalfa silage and rolled barley. Throughout the experiment, the silage and grain were fed rather late in the morning and evening, and though not eaten immediately, practically all was consumed by the next feeding time. The hay was fed separately twice a day in hay racks.

The alfalfa hay fed during the greater part of the experiment was good second-cutting hay, clean and free from weeds. The silage, as stated, was made from the first cutting of alfalfa and contained a large proportion of weeds, principally foxtail. A botanical analysis of a sample of the silage, made by Professor P. B. Kennedy, showed that it was composed of over 55 per cent foxtail. While this may not represent the true percentage of weeds in the entire lot of silage, it is believed we may safely assume that at least one-half of the bulk of the silage consisted of plants other than alfalfa. Many of the loads were quite dry as filled into the silo and considerable water was added after each load and also after the silo was filled, in order to improve the quality of the silage.

The silage as fed out was well made, of a dark brown color and of slightly acidulated, aromatic flavor. That in the lower part of the silo was more moist than that in the upper part and was apparently relished best by the steers. While most of the silage was not taken with particular relish, it was always eaten up clean, with the exception of a few days during the middle of July when a layer of partially spoiled silage was reached, at a point where the filling of the silo had been interrupted for a couple of days. The foxtail heads, which would have caused great trouble in feeding the alfalfa as hay, were eaten before having a chance to dry out.

The silage was sampled once every week for determinations of moisture and acidity and a complete chemical analysis of the mixed samples was made by Professor M. E. Jaffa, who also made analyses of the other feeds used in the experiment. The chemical composition of these feeds with digestible components calculated on the basis of average digestion coefficients is shown below.

Chemical Composition of Feeding Stuffs, in per cent

	Alfalfa silage	Alfalfa hay	Barley
Moisture	76.00	15.87	12.36
Protein	3.40	11.32	10.37
Fat	.34	1.30	1.80
Fiber	5.56	28.63	6.26
Nitrogen-free extract	11.72	35.85	66.61
Ash	2.98	7.03	2.60
	100.00	100.00	100.00
Volatile acids	.40	.....	.....
Fixed acids	.91	.....	.....
Digestible protein	1.29	8.38	7.27
Digestible carbohydrates and fat	8.28	40.17	68.20
Nutritive ratio	1:6.4	1:4.9	1:9.4

The feeding test was started on July 20th when the steers had recovered their normal fill. The experiment progressed without important incidents, except that one steer, which was found tubercular at slaughtering time, went off feed and failed to gain in weight. The steers on the whole showed a marked improvement in condition throughout the experiment, and with the exception noted all were in fair condition when sold, although but few could have been classed as finished for market. To one who watched the steers closely from day to day, it seemed that now and then a steer that had been doing especially well would stop gaining. The apparent explanation of this was revealed by an examination of the carcasses after slaughter, when it was found that there were accumulations of foxtail in the mouths of practically all the steers. This condition suggests that had the experiment continued much longer, trouble might have developed as in the case of foxtail hay, and emphasizes the necessity for cutting the alfalfa for silage before the foxtail beards become hard. From August 21st on, only one-half feed of silage was fed, the amount of barley being increased by two pounds. The trial brought to a close on September 3rd, when the silage was fed out.

The following statement shows the main results of the trial:

Weight of steers July 6 at shipping point	963 lbs.
Weight of steers July 8 off cars at Davis	883 lbs.
Weight of steers July 20 at University Farm	971.2 lbs.
Weight of steers Sept. 3, selling weight	1041.08 lbs.
Average daily gain per head	1.53 lbs.

	Hay	Silage	Barley
Average daily ration per head	10.6 lbs.	20.2 lbs.	8.4 lbs.
Feed per lb. gain for the period of 46 days	6.9 lbs.	13.1 lbs.	5.4 lbs.

The composition of this ration on the basis of the chemical analyses made was as follows:

Dry matter	21.13 lbs.
Digestible protein	1.76 lbs.
Digestible carbohydrates and fat	11.66 lbs.
Nutritive ratio	1:6.6 lbs.

FINANCIAL STATEMENT

The steers were sold on September 3rd, at 7 cents a pound with a 3 per cent shrink. In the following financial statement of the feeding trial, the item of feed eaten includes all the feed which the steers received from the time they were bought until they were sold. The

prices of feeds given were those prevailing in this locality during the past summer, except that of silage which was assumed to cover the cost of production only, since weedy alfalfa like that used in the making of this silage has practically no value for feeding as hay and the silage itself has no established market value.

Initial cost of steers, 103,099 lbs. at 6c.		$6,185.94	
Freight from Coyote to Davis (4 cars at $33.04 per car)		132.16	
Sanding cars		2.00	
Commission for buying 107 head at 50c. per head		53.50	
Interest on $6,373.60 at 8 per cent		84.98	
Refund on account one tubercular steer		47.60	
Feed eaten: 31.4 tons hay at $4.00	$125.60		
23.24 tons barley at $18.50	429.94		
58.32 tons silage at $1.25	72.90		
		628.44	
Labor, approximately one-half time of one man		50.00	
Horse and wagon		15.00	
Total cost			$7,199.62
Selling price, 108,126 lbs. at 7c.			7,568.82
Net profit on entire lot			$369.20

Charging against the steers only the cost of feed and labor and interest on the money invested, as would be done by a man feeding his own cattle, the profit would come to $556.86. Charging alfalfa hay at its normal market value of $6 a ton in the stack and barley at $21 a ton, there would still be a profit of $436.06 from the feeding operation.

This trial shows that silage may be made from weedy alfalfa which would make but inferior hay, that such silage will be eaten without waste, and that it can be used as a supplementary feed for fattening steers on alfalfa hay and barley.